

WARM UP

The table gives values for differentiable functions $f(x)$ and $g(x)$ & their derivatives at selected values.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	-2	$\frac{5}{2}$	13
2	-3	5	5	$-\frac{1}{2}$

1. If $h(x) = [f(2x)]^3$, use the table to find $h'(1)$
2. If $K(x) = \sqrt[3]{f(x) + 2g(x)}$, find $K'(1)$

u-Substitution: Definite Integration Edition

Objective:

- Evaluate a definite integral using u-substitution.
- Change the limits of integration for the variable u .

THEOREM 4.15 Change of Variables for Definite Integrals

If the function $u = g(x)$ has a continuous derivative on the closed interval $[a, b]$ and f is continuous on the range of g , then

$$\int_a^b f(g(x))g'(x) dx = \int_{g(a)}^{g(b)} f(u) du.$$

Example 1: $\int_0^2 x^2 \sqrt{x^3 + 1} dx$

Example 2: $\int_0^{\pi/4} \tan^3 \theta \sec^2 \theta d\theta$

Example 3: $\int_1^5 \frac{x}{\sqrt{2x-1}} dx$

Example 4: AP style MC

Using the substitution $u = x^2 - 3$, $\int_{-1}^4 x(x^2 - 3)^5 dx$ is equal to which of the following?

(A) $2 \int_{-2}^{13} u^5 du$ (D) $\int_{-1}^4 u^5 du$

(B) $\int_{-2}^{13} u^5 du$ (E) $\frac{1}{2} \int_{-1}^4 u^5 du$

(C) $\frac{1}{2} \int_{-2}^{13} u^5 du$